

We claim:

1. A rotary magnetic detent device comprising:

an inner member having a first rim;

a plurality of inner magnets disposed in the first rim and distributed regularly and peripherally around said first rim, the inner magnets having radially oriented north and south magnetic poles, and alternate adjacent ones of said inner magnets having alternate radially outwardly directed north and south poles;

an outer member receiving the inner member, said members being rotatable relative to each other, the outer member having a second rim which receives the first rim;

a plurality of outer magnets disposed in the second rim and distributed regularly and peripherally around said second rim, the outer magnets having radially oriented north and south magnetic poles, and alternate adjacent ones of said outer magnets having alternate radially inwardly directed north and south poles, the inner and outer magnets opposing and attracting each other to form a plurality of detent positions as the inner and outer members are rotated with respect to each other; and

a magnetic field sensor which generates a signal in response to relative rotation of the inner and outer members.

2. The rotary magnetic detent device of claim 1, wherein:

the inner magnets have a first angular spacing therebetween, and the outer magnets have a second angular spacing therebetween.

3. The rotary magnetic detent device of claim 2, wherein:

the first angular spacing is the same as the second angular spacing.

4. The rotary magnetic detent device of claim 2, wherein:

the inner magnets have a first angular spacing therebetween, and the outer magnets have a second angular spacing therebetween, the first angular spacing being the same as the second angular spacing so that when the inner magnets having outwardly oriented north poles are adjacent to the outer magnets having inwardly oriented south poles, the inner magnets having outwardly oriented south poles are adjacent to the outer magnets having inwardly oriented north poles.

5. The rotary magnetic detent device of claim 2, wherein:

the inner magnets have a first angular spacing therebetween, and the outer magnets have a second angular spacing therebetween, the first angular spacing being the same as the second angular spacing so that when the inner magnets having outwardly oriented north poles are adjacent to the outer magnets having inwardly oriented north poles, the inner magnets having outwardly oriented south poles are adjacent to the outer magnets having inwardly oriented south poles.

6. The rotary magnetic detent device of claim 1, wherein:

a slot is formed in one of the first and second rims; and  
the magnetic field sensor is received in said slot.

7. The rotary magnetic detent device of claim 1, wherein:

a slot is formed in an outer surface of the first rim; and  
the magnetic field sensor is received in said slot.

8. The rotary magnetic detent device of claim 1, wherein:

the outer member has an outer peripheral surface which forms a thumbwheel surface for manipulation by an operator.

9. A rotary magnetic detent device comprising:

an inner member;

an outer member receiving the inner member, said members being rotatable relative to each other;

a plurality of inner magnets distributed regularly and peripherally around the inner member, the inner magnets having radially oriented north and south magnetic poles, and alternate adjacent ones of said inner magnets having alternate radially outwardly directed north and south poles;

a plurality of outer magnets distributed regularly on said outer member, the outer magnets having radially oriented north and south magnetic poles, and alternate adjacent ones of said outer magnets having alternate radially inwardly directed north and south poles, the inner and outer magnets opposing and attracting each other to form a plurality of detent positions as the inner and outer members are rotated with respect to each other; and

a magnetic field sensor which generates a signal in response to relative

rotation of the inner and outer members.

10. The rotary magnetic detent device of claim 9, wherein:  
a slot is formed in one of the inner and outer members; and  
the magnetic field sensor is received in said slot.

11. The rotary magnetic detent device of claim 9, wherein:  
a slot is formed in an outer surface of the inner member; and  
the magnetic field sensor is received in said slot.

12. The rotary magnetic detent device of claim 9, wherein:  
the outer member has an outer peripheral surface which forms a thumbwheel  
surface for manipulation by an operator.